TEMPORAL EFFECT OF FOAM ROLLER AND VIBRATION THERAPY ON SELECTED PHYSIOLOGICAL VARIABLES ON ATHLETES AFTER A SINGLE BOUT OF INTENSE EXERCISE

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INTRODUCTION

Unaccustomed physical activites can be the cause of exercise induced muscle damage. Varying either the duration or the volume can create an unaccustomed activity session.Exercise induced muscle damage can lead to increased metabolic rate. (Tee, 2007). Skeletal muscle damages need to be identified for implementing different therapeutic modalitied for better recovery.Serum Creatine kinase, Myoglobin and Lactate dehydrogenase has been used for many researches as a standard source of metabolic biomarkers. Creatine Kinase is associated with muscle damage as damaged skeletal muscles release Ck in bloodstream which elevate Ck level in blood which indicates muscle damage. (Rebalka, (2014).). Unaccustomed activity can lead to delayed onset of muscle damage(DOMS). (Cheung, 2003).Pain pressure threshold is an indication of DOMS . It has seen decreased in many researches 48 hour post exercise. (Willian da Silva, Relationship between exercise-induced muscle soreness, pain thresholds, and skin temperature in men and women, 2021). A significant drop of Pain pressure threshold (PPT) is seen after exhaustive endurance activities along with more pain sensitivity. (Krüger, 2016).Higher intensity of training leads to higher muscle disruption and increase in serum Creatine kinase level in the blood stream.Ck levels starts increasing after 3 hours of intense exercise and it peaks after 24 to 48 hours. (Baird, 2012).Blood lactate levels also get affected from high intensity exercise as a result of anaerobic metabolism and muscle damage. (Gleeson, 1998). In case of active and passive recovery given to an athlete after an intense bout of exercise , the lactate level is observed to decrease within 30-32 minutes. (Menzies, 2010).DOMS is supposed to be tackled in two ways-prophylactic and therapeutic. Although there is no gold standard to deal with DOMS but vibration therapy has shown significant results in dealing with DOMS. It is observed in different researches that vibration therapy after intense physical activity has shown effectiveness in flexibility, muscular strength, blood flow and range of motion. (Veqar, 2014). Some researches show that foam roller can also help in reducing muscle soreness after intense physical activity in comparison to the control group. (D'Amico, 2020) Research indicates that vibrating foam roller is a better therapeautic measure in reducing indicators of Exercise induced muscle damage than the non vibrating foam rollers.It also shows vibration enhances the analgesic effects of foam rolling. (Romero-Moraleda B. G.-G.-R.-G., 2019)

STATEMENT OF THE PROBLEM

The purpose of the study is to find the effect of foam roller therapy and vibration therapy on EIMD(Creatine kinase, blood lactate accumulation and Pain Pressure Threshold) after a bout of intense exercise.

RESEARCH QUESTION

Is there any effect of foam roller therapy and vibration therapy on EIMD(Creatine kinase, blood lactate accumulation and Pain Pressure Threshold) after a bout of intense exercise.

OBJECTIVE OF THE STUDY

1.To find the effect of foam roller therapy on EIMD after a bout of intense exercise.

2.To find the effect of vibration therapy on EIMD after a bout of intense exercise.

DELIMITATIONS

1.The study will be confined to young athletes.

2.The study will be delimited to the athletes aged 18 to 22 years.

3.The study will be further delimited to 30 athletes.

4.The athletes will be actively practicing for last 2 years.

5.The effect of foam roller therapy and vibration therapy on EIMD after a bout of intense exercise.

HYPOTHESIS

On the basis of literature and research scholar's understanding the following hypothesis are formulated-

Ha1:It is hypothesized that there will be significant difference in Pain Pressure Threshold, Creatine kinase and lactate level after 24 hours of using foam roller therapy after a single bout of intense exercise.

Ha2: It is hypothesized that there will be significant difference in Pain Pressure Threshold, Creatine kinase and lactate level after 48 hours of using foam roller therapy after a single bout of intense exercise.

Ha3: It is hypothesized that there will be significant difference in Pain Pressure Threshold, Creatine kinase and lactate level after 72 hours of using foam roller therapy after a single bout of intense exercise.

Ha4: It is hypothesized that there will be significant difference in Pain Pressure Threshold, Creatine kinase and lactate level after 24 hours of using vibration therapy after a single bout of intense exercise.

Ha5: It is hypothesized that there will be significant difference in pain tolerance, Creatine kinase and lactate level after 48 hours of using vibration therapy after a single bout of intense exercise.

Ha6: It is hypothesized that there will be significant difference in pain tolerance, Creatine kinase and lactate level after 72 hours of using vibration therapy after a single bout of intense exercise.

SIGNIFICANCE OF THE STUDY

1.The knowledge about therapeutic effect of different modalities will increase.

2.Better modality for recovery after intense bout of exercise can be understood.

3.It will put light on the effect of therapeutic modalities on physiological biomarkers.

4.It will add knowledge to the existing source of knowledge.

5.It will increase specific knowledge of recovery on the athletes.

CHAPTER 2

REVIEW OF RELETED LITERATURE

(Hong) Pressure algometer has been used to document the tenderness of MTrPs. It was also applied to measure the referred pain threshold and pain tolerance. The reliability and validity of measurements with PA have been established. The therapeutic effectiveness of various procedures on MTrPs have been assessed by the measurement of pressure threshold with algometer. Pressure algometer is a valuable and reliable instrument in the assessment of MTrPs sensitivity. It has been used successfully for the evaluation of MTrPs, to confirm the diagnosis, and to quantify irritability. Therapeutic effectiveness of various procedures on MTrPs can be quantified by algometry. 1

(Xiong. S.. Goonetilleke, 2011) An indentation apparatus was used with four sizes of indentation probes and three indentation speeds. In total, 13 locations on the right foot of 10 male and 10 female participants were tested to determine the pressure discomfort thresholds (PDT) and pressure pain thresholds (PPT). Results show that the tests had very good measurement reliability with intra-class correlations (CC) greater than 0.8 for the PPT measurements and acceptable reliability (most ICC> 0.75, with a few between 0,5 and 0.75) tor the PDT measurements, demonstrating that participants are capable of judging their pain and discomfort thresholds. 2

(Da Silva. W.. Machado, 2021)Twenty -two physically active adults (10 men and 12 women) completed a squat exercise protocol to induce muscle damage. Skin temperature. DOMS, and pressure pain threshold (PPT) were assessed in the quadriceps pre, post-exercise, and 48 h post-exercise. DOMS increased similarly in men and Women post-exercise and 48 h post-exercise. PPT was lower in women compared to men. PPT decreased 48 h post-exercise for men but did not differ between the moments for women. Skin temperature responses were sex-dependent. Mean and maximum temperatures increased post-exercise for men, and maximum temperature reduced 48 h post-exercise. In women, the minimum temperature increased 48 h post-exercise. DOMS was not predicted by skin temperature but showed a direct association between pre and 48 h post-exercise variation of maximum skin temperature and PPT. We conclude that there is a sex-dependent effect in analysing skin temperature changes in response to exercise, something that seems to not have been addressed in previous studies. To date, inferences are generally assumed as similar for both men and women, which we show may not be the case.3

(Koch. A. J., 2014)Resistance exercise can result in localized damage to muscle tissue. This damage may be observed in sarcolemma, basal lamina, as well as, in the contractile elements and the cytoskeleton. Usually the damage is accompanied by release of enzymes such as creatine kinase (CK) and lactate dehydrogenase, myoglobin and other proteins into the blood. Serum CK has been proposed as one of the best indirect indicators of muscle damage due to its case of identification and the relatively low cost of assays to quantify it. Thus, CK has been used as an indicator of' the training intensity and a diagnostic marker of overtraining. However, some issues complicate CK's use in this manner. There is great interindividual variability in serum CK, which complicales the assignment of reliable reference values for athletes. Furthermore factors such as training level, muscle groups involved, and gender can influence CK levels to a greater extent than differences in exercise volume completed. This review will detail the process by which resistance exercise induces a rise in circulating CK, illuminate the various factors that affect the CK response to resistance exercise, and discuss the relative usefulness of CK as a marker of training status, in light of these factors.4

(Barnes. M. J., 2012)Eight healthy males completed 300 maximal eccentric contractions of the quadriceps of one leg on an isokinetic dynamometer. Immediately after exercise and 12 and 24 h post-exercise, the subjects underwent either VT or a control treatment of no VT. Five sets of l min VT was performed at 26 Hz, with 6 mm peak-to-peak displacement, on a commercially available vibration machine. At least 2 weeks after the initial trial, the subjects completed the second trial using the contralateral leg and other treatment. Peak and average peak isometric tension and isokinetic concentric and eccentric torque were measured prior to exercise and 24 and 48 h post-exercise. Treatment with VT resulted in significantly (all $P < 0.05$) greater decrements in peak (-38%) and average peak eccentric (-39%) torque 24 h after eccentric exercise as compared to a control treatment (-24 and -29%, respectively). These results suggest that the use of 26 Hz VT in the first 24 h after damaging exercise may be detrimental to the magnitude of force loss and/or recovery over this period.5

(Medeiros, 2020)There was no significant group by time interaction for MIVC (p 0.090) and ROM (p 40.416). Also, although there was a significant 0.028), post hoc test did not group by time interaction for muscle thickness (p find significant difference between groups ($p > 0.05$). DOMS was recovered at 72 h for roller massage ($p < 0.001$) and control ($p < 0.001$) groups, while the Sham group did not recover from DOMS across 72 h (p 0.05). Conclusions: A single session of roller massage applied on elbow flexors had no effect on recovery of MIVC, muscle swelling, ROM and DOMS.6

(D'Amico A. P., 2019)Thirty-seven male individuals performed 40 x 15-m sprints, inducing muscle damage. Immediately after sprinting and in the 4 days following, perceived muscle soreness, hip abduction range of motion (ROM). hamstring muscle length, vertical jump (VJ), and agility measures were recorded. Eighteen subjects (mean + SD; age 22,4 + 2.0 years; BMI |body mass index| 26.9 ± 4.2 kg m-2) foam rolled before testing each day. whereas |9 (mean + SD: age 23.2+3.2 years: BMI 26.3 :4.0 kg m- 2) served as a non-FR control (CON). Measurements recorded during the days of recovery from the repeated sprint protocol were compared with week 1 baseline measurements and these data were compared by condition using a 2 tailed Mann-Whitney U-test (alpha level 0.05). Perceived soreness, hip abduction ROM. hamstring muscle length, and VJ were not significantly different 0.25). Agility was less impaired in the FR condition (p 0.0049) as AUC was higher in CON (2.88± 2.45 seconds) than in FR (0.33 t between groups (p >2.16 seconds). Based on these data. FR appears to expedite recovery of agility after EIMD instigated by a repeated sprint protocol. Foam rolling may be useful for athletes requiring adequate agility who need to recover quickly from demanding bouts of exercise.7

(Romero-Moraleda, 2019)Thirty-eight healthy volunteers (32 men. 6 women: aged 22.2+3.2 years) were randomly assigned in a counter-balanced fashion to either a VFR or NVFR protocol group. All participants pertormed a 10x 10 (sets x repetitions) eccentric squat protocol to induce muscle damage.

The protocols were administered 48-h post-exercise, measuring VAS, PPT, SmO2. CMJ and ROM. before and immediately post-treatment. The treatment technique was repeated on both legs for 1 minute for a total of five sets, with a 30-s rest betw een sets. The VFR group showed substantially greater improvements (likely to very likely) in the passive VAS (VFR -30.2%, 90% CI -66.2 to -12.8) with chances for lower. similar or greater VAS compared with the NVFR group of 82%. 14% and 4%, respectively and passive extension hip joint ROM (VFR 9.3%. 90% CI 0.2-19.2)) with chances for lower, similar or greater ROM compared with the NVFR group of 78%, 21% and 1%, respectively. For intragroup changes, we observed substantial improvements in VAS (p=.05), lateral vastus. rectus femoris and medial vastus PPT. The results suggest that the VFR group achieved greater short-term benefits in pain perception and passive extension hip joint ROM. Both protocols were effective in improving PPT, Sm02. CMJ and knee joint ROM. The enhanced improvement in VAS and hip ROM measures could have significant implications for VFR treatment.8

DEFINITION AND MEANING OF THE TERMS

A.Creatine Kinase(Ck)- Creatine kinase (CK), also known as creatine phosphokinase (CPK), is an enzyme found in muscle cells, brain cells, and the heart, playing a crucial role in muscle energy production.

B.Pain Pressure Threshold(PPT)- Pain pressure threshold (PPT) refers to the minimal amount of pressure that needs to be applied to a specific body area to cause a person to experience a painful sensation.

C.Lactate-Lactate, also known as lactic acid, is a chemical your body produces when cells break down carbohydrates for energy, particularly when there's not enough oxygen available.

D.Foam Roller-A foam roller is a cylindrical tool, usually made of dense foam, used for self-myofascial release (SMR), which is a form of self-massage.

E.Vibration Therapy-Vibration therapy is a therapeutic approach that utilizes mechanical vibrations to stimulate the body, often with the goal of improving muscle strength, range of motion, and reducing pain.

METHODOLOGY

In the chapter. the selcction of subjects, selection of variable, administration of test, collection of data and statistical techniques for analysis of data has been described.

SELECTION OF SUBJECT

- 30 Subject age ranging between 18 to 22 would be selected.
  Group A -control group

Group B -Experimental group 1
Group C- Experimental group 2

- Only athletes who are regularly practicing for last 2 years will be selected as subjects.

SELECTION OF VARIABLE

Following are the test variables

- Creatine Kinase
- Blood lactate
- Pain Pressure Threshold

ADMINISRATION OF TEST

30 regular athletes will be selected. They will be given instruction about the test procedure that is going to be held. A pre test of pain tolerance using pressure algometer will be there. Then a intense bout of exercise will be there. Immediately after the exercise blood samples of all the 30 players will be collected for blood lactate level. Then 10 of the players will be given foam roller recovery, l0 will be given vibrating machine recovery and the rest 10 will be placebo. After giving the recovery treatment data will be taken after 24 hours,48 hours and 72 hours.

CRITERION MEASURE

SL NO	VARIABLES	TEST	UNIT OF MEASUREMENT
1	CREATINE KINASE	ROUTINE BLOOD TEST	U/L(Unit per litre of blood)
2	BLOOD LACTATE	ROUTINE BLOOD TEST	Mnmol/L(millimole per litre of blood)
3	PAIN PRESSURE THRESHOLD	PRESSURE ALGOMETER	Kg/cm2(Kilogram per centimetre square)

STATISTICAL PROCEDURE

Descriptive and comparative statistics will be used. Pain pressure tolerance will be measured 3 times. The creatine kinase will be measured 3 times. The blood lactate will be measured 2 times.

For data normality Shapiro wilk test will be used.

For measuring group mean ANOVA will be used.

Level of significance will be 0.05.

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